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METHODS OF PACKING EGGS AND OF BUFFING AND BRACING CASES OF EGGS IN CARLOAD SHIPMENTS[1]

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INTRODUCTION

Egg breakage during shipment is a matter of vital importance to shippers and receivers of eggs and to transportation companies. Egg-packing materials are constantly being developed in an effort to obtain an increasing degree of efficiency. In consequence a number of methods of packing are at present in commercial use and differences of opinion have arisen as to which are the most efficient.

Exhaustive tests of the various methods have been undertaken from time to time under laboratory conditions, but no recent extensive tests have been made under commercial conditions. At a meeting held by the interrelations committee early in 1925, it was decided to undertake such a series of tests.[2]

[1] This study was made under the auspices of the interrelations committee, composed of representatives of the National Poultry, Butter, and Egg Association, National Association of Egg Case and Egg Case Filler Manufacturers, American Railway Express Co., and American Railway Association.

[2] In addition to the organizations composing the interrelations committee, the Western Weighing and Inspection Bureau, the Consolidated Classification Committee, the Live Poultry and Dairy Shippers Traffic Association, and Swift & Co. were represented at this meeting. The Central Weighing and Inspection Bureau, the Trunk Line Freight Inspection Bureau and the Freight Container Bureau, American Railway Association, also cooperated in the conduct of these tests.

The eggs and the facilities of the plants at the various shipping points were furnished by Swift & Co. The National Association of Egg Case and Egg Case Filler Manufacturers furnished the necessary supplies not in use at these plants.

The conduct of the tests was under the direct supervision of an operating committee consisting of Frank Crow, chairman, and L. E. Turney, both of Swift & Co.; Frank F. Frye and N. T. Mutzl, of the Western Weighing and Inspection Bureau, and Roy. C. Potts and Rob R. Slocum of the Bureau of Agricultural Economics, United States Department of Agriculture. The work in the field was in charge of Mr. Slocum.

The purpose of the tests was to compare the merits of eight different methods of packing and the merits of straw and hay buffing and wood bracing for loading purposes as these are the methods of buffing and bracing in commercial use and provided for in the consolidated freight classification.

SHIPMENTS MADE

Six shipments were made, each consisting of two cars. Each separate shipment was designated by a letter. The first was shipment A and the others were lettered B, C, D, E, and F in chronological order of shipment. The dates of shipment and arrival, points between which moved, and the routings were as follows:

Shipment A—March 28 to April 3, 1925. Enid, Okla., to Boston, Mass. Routing: Rock Island, Indiana Harbor Belt, Michigan Central, New York Central, Boston & Albany, and Union Freight delivery.

Shipment B—April 17 to April 21, 1925. Wichita, Kans., to East St. Louis, Ill. Routing: Atchison, Topeka & Santa Fe, and Wabash.

Shipment C—April 20 to April 23, 1925. Hutchinson, Kans., to East St. Louis, Ill. Routing: Rock Island.

Shipment D—May 2 to May 5, 1925. Clarinda, Iowa, to Chicago, Ill. Routing: Chicago, Burlington & Quincy, and Chicago Junction delivery.

Shipment E—May 16 to May 22, 1925. Columbus, Nebr., to Washington, D. C. Routing: Union Pacific, Illinois Central, Indiana Harbor Belt, Fort Wayne, Cincinnati & Louisville, and Pennsylvania.

Shipment F—May 29 to June 3, 1925. Marion, Ind., to Jersey City, N. J. Routing: Cloverleaf, Erie, and Delaware, Lackawanna & Western.

EGGS USED

In shipment A, the eggs used were rehandled current receipts, not candled. In shipment D, the eggs were rehandled No. 1 storage packed, not candled. In the B, C, E, and F shipments the eggs were rehandled and candled No. 1 storage packed.

METHODS OF PACKING

Each of the eight methods of packing was assigned a number which was retained throughout all the shipments. Except as otherwise specified, all packing materials used were of the standard in general commercial use. In the first or A shipment the packs were as follows:

Pack 1.—Standard case, 10 fillers, 12 flats and 4 excelsior pads. One pad was used in each compartment of the case on the bottom with a flat above and one pad in each compartment on top of the case with a flat underneath.

Pack 2.—Standard case, 10 fillers, 6 flats, and 6 excelsior pads. In each compartment of the case one pad was used on the bottom and one on top, and one under the top filler. Wherever a pad was used, the flat was omitted.

Pack 3.—Cut down case, three-eighths inch less in depth than a standard case, 10 fillers, 12 flats, and 4 excelsior pads. Pads and flats placed as in pack 1.

Pack 4.—Standard case, 10 fillers one-eighth inch deeper than standard fillers and with cells around the entire outside slightly wider than standard, 8 flats, and 4 excelsior pads. In each compartment of the case an excelsior pad was used on bottom and top without a flat.

Pack 5.—Standard case, 10 fillers, 8 flats, and 8 cup flats. In each compartment of the case 2 cup flats were used on the bottom and 2 on the top in place of excelsior pads, the flats being placed back to back with the cups out.

Pack 6.—Standard case, 10 fillers, 16 cup flats. In each compartment of the case 2 cup flats were used on the bottom and 2 on the top in place of excelsior pads, the flats being placed back to back with the cups out. The flats used between the fillers were used singly with cups up.

Pack 7.—Cut down case, three-eighths inch less in depth than a standard case, 10 fillers, 12 embossed flats, and 4 excelsior pads. Pads and flats placed as in pack 1.

Pack 8.—Standard case, 10 fillers, 8 embossed flats, and 8 cup flats. The cup flats were used instead of excelsior pads and were placed the same as in pack 5.

CHANGES MADE

Packs 1 and 2.—The only change made in these packs was in shipment C, when straw pads were substituted for excelsior pads, to test the efficiency of the straw pads as compared with the excelsior pad.

Packs 3, 4, 5, and 8.—No changes were made in these packs throughout the test.

Pack 6.—In all shipments after shipment A one cup flat on top of each compartment of the case was omitted, the single cup flat used in these locations being placed with cups up. This change was made because the use of two cup flats on top filled the case too full and resulted in too great a bulge when the covers were nailed on.

Pack 7.—In the E and F shipments, the embossed flat used under the excelsior pad on top of each compartment of the case was omitted because the packing as used in the previous shipments caused too great a bulge when the cover was nailed on.

METHODS OF HANDLING EGGS AND MARKING CASES

The eggs used in these tests were handled and packed at each plant under the direct supervision of those in charge of the test. Each case was stenciled on the end with the number representing the kind of pack used and with the letter which designated the particular shipment. For example, a case senciled 6 C meant that the case was packed according to pack No. 6 and that it was a part of the third shipment.

In each car, two cases of each of the eight different packs were set aside as special experimental cases. These special cases were carefully candled, checked, and packed by those in charge of the tests to determine the number of damaged eggs they contained. A diagram was used for each case on which the exact location in the case of each damaged egg was noted and the extent to which it was damaged. Such eggs were classed as: Blind checks, or eggs which were checked but so slightly that the check was not visible except before the candle; checks or eggs which were checked sufficiently so that the break in the shell was visible without candling but without any leakage; and leakers or eggs from which there was a

perceptible leakage of the egg contents from the shell (fig. 1). These special cases were stenciled on the end, like all other cases in the shipment, with a number representing the pack, and a letter representing the shipment, and a final number (from 1 to 4) which served to identify the particular case at destination for the purpose of reinspection. For example, the fourth of the four experimental cases inspected of the No. 6 pack in the fifth shipment was stenciled 6–E–4.

TYPES OF CARS USED

All shipments were made in refrigerator cars. Cars of the Swift Refrigerator Line were used in all except the B and C shipments, which were loaded in Santa Fe and Rock Island cars respectively.

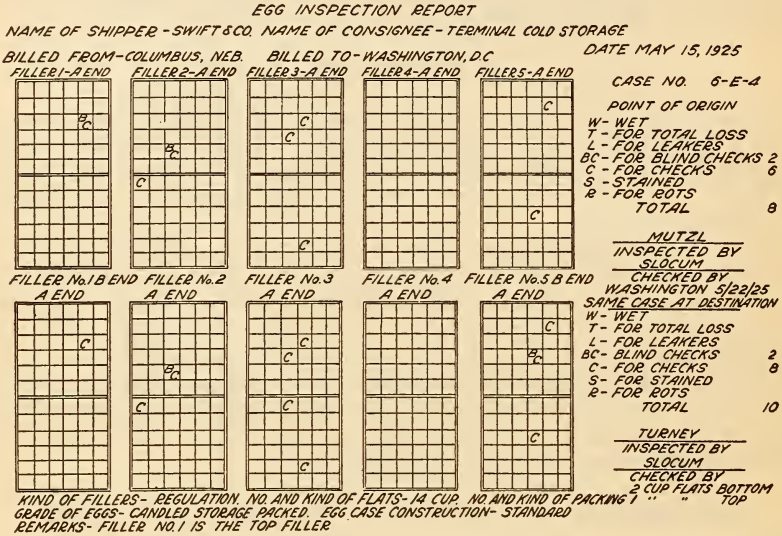
EGG INSPECTION REPORT
NAME OF SHIPPER - SWIFT & CO. NAME OF CONSIGNEE - TERMINAL COLD STORAGE
BILLED FROM - COLUMBUS, NEB. BILLED TO - WASHINGTON, D.C
DATE MAY 15, 1925
FILLER 1 - A END
FILLER 2 - A END
FILLER 3 - A END
FILLER 4 - A END
FILLER 5 - A END
CASE NO. 6-E-4
POINT OF ORIGIN
W - WET
T - FOR TOTAL LOSS
L - FOR LEAKERS
BC - FOR BLIND CHECKS 2
C - FOR CHECKS 6
S - STAINED
R - FOR ROTS
TOTAL 8
MUTZL
INSPECTED BY
SLOCUM
CHECKED BY
WASHINGTON 5/22/25
SAME CASE AT DESTINATION
W - WET
T - FOR TOTAL LOSS
L - FOR LEAKERS
BC - BLIND CHECKS 2
C - FOR CHECKS 8
S - FOR STAINED
R - FOR ROTS
TOTAL 10
TURNEY
INSPECTED BY
SLOCUM
CHECKED BY
FILLER No. 1 B END A END
FILLER No. 2 A END
FILLER No. 3 A END
FILLER No. 4 A END
FILLER No. 5 B END A END
KIND OF FILLERS - REGULATION NO. AND KIND OF FLATS - 14 CUP NO. AND KIND OF PACKING 1 2 CUP FLATS BOTTOM
GRADE OF EGGS - CANDLED STORAGE PACKED. EGG CASE CONSTRUCTION - STANDARD 7 " " TOP
REMARKS - FILLER NO. 1 IS THE TOP FILLER

FIG. 1.—Case diagram showing location of broken eggs at shipping point and at destination

METHODS OF LOADING

The straight-joint method of loading was employed. All cars were loaded 8 cases wide. All Swift refrigerator cars were loaded 13 cases long, the Santa Fe cars were loaded 14 cases long, and the Rock Island cars 15 cases long. All Swift cars were loaded 4 cases high for 6 rows from one end and 5 rows from the other end, and with 2 rows at the center of the car 3 cases high, a total of 400 cases per car. The Santa Fe cars were loaded 4 cases high for 6 rows from each end, with 2 rows at the center 3 cases high, a total of 432 cases per car. The Rock Island cars were loaded 4 cases high for 5 rows from each end, and with 5 rows 3 cases high at the center, a total of 440 cases.

In each shipment the different packs were loaded in separate rows extending throughout the length and height of the load. In the first or A shipment pack No. 1 was loaded next to the side of the car

extending from bunker to bunker, the other packs being loaded in the same manner in consecutive order as follows: Nos. 1, 2, 3, 4, 5, 6, 7, and 8. The same plan was followed in subsequent shipments except that the packs were shifted each time one position toward the starting side, or as follows in shipment B: Nos. 2, 3, 4, 5, 6, 7, 8, and 1. The 16 inspected or experimental cases included in each car were placed 8 in each end and on top next to the bunker and in their respective order as to packing (figs. 2 and 3).

DIAGRAM OF TOP LAYER OF LOAD IN CAR SRL 16337 SHIPMENT A

	8A1	8A	8A	8A	8A	8A	8A		8A	8A	8A	8A	8A	8A4	
	7A4	7A	7A	7A	7A	7A	7A		7A	7A	7A	7A	7A	7A3	
	6A4	6A	6A	6A	6A	6A	6A		6A	6A	6A	6A	6A	6A3	
	5A3	5A	5A	5A	5A	5A	5A		5A	5A	5A	5A	5A	5A4	
A	4A4	4A	4A	4A	4A	4A	4A	CENTER OF LOAD	4A	4A	4A	4A	4A	4A3	B
END	3A1	3A	3A	3A	3A	3A	3A		3A	3A	3A	3A	3A	3A4	END
	2A2	2A	2A	2A	2A	2A	2A		2A	2A	2A	2A	2A	2A3	
	1A3	1A	1A	1A	1A	1A	1A		1A	1A	1A	1A	1A	1A2	

CROSS SECTION OF LOAD AT B END OF CAR SRL 16337
SHIPMENT A

1A2	2A3	3A4	4A3	5A4	6A3	7A3	8A4
1A	2A	3A	4A	5A	6A	7A	8A
1A	2A	3A	4A	5A	6A	7A	8A
1A	2A	3A	4A	5A	6A	7A	8A

FIG. 2.—Location and arrangement of the different packs and the experimental cases in one of the cars of the first shipment

	1B4	1B	1B	1B	1B	1B	1B		1B	1B	1B	1B	1B	1B	1B3	
	8B4	8B	8B	8B	8B	8B	8B		8B	8B	8B	8B	8B	8B	8B3	
	7B4	7B	7B	7B	7B	7B	7B		7B	7B	7B	7B	7B	7B	7B3	
	6B4	6B	6B	6B	6B	6B	6B		6B	6B	6B	6B	6B	6B	6B3	
A	5B4	5B	5B	5B	5B	5B	5B		5B	5B	5B	5B	5B	5B	5B3	B
END	4B4	4B	4B	4B	4B	4B	4B	CENTER OF LOAD	4B	4B	4B	4B	4B	4B	4B3	END
	3B4	3B	3B	3B	3B	3B	3B		3B	3B	3B	3B	3B	3B	3B3	
	2B4	2B	2B	2B	2B	2B	2B		2B	2B	2B	2B	2B	2B	2B3	

FIG. 3.—Top layer of load in car SFRD 7114, shipment B, showing by comparison with Figure 2 the manner in which the location of the packs was changed with each successive shipment

BRACING AND BUFFING

In each shipment two methods of buffing were used, one car being buffed with straw and the other braced with wooden frames, which were the usual Swift provision or floor racks.

In the car buffed with straw an egg frame constructed of 2 by 4's, the height of one case, and of varying thickness according to the length of the car, was placed on the floor rack in each end of the car tight against the opening at the bottom of the bunker. Strips of egg-case lids were nailed on top of these frames to prevent the straw from

falling down and blocking the opening into the bunker (fig. 4). On top of each frame a cushion of straw of the same thickness as the

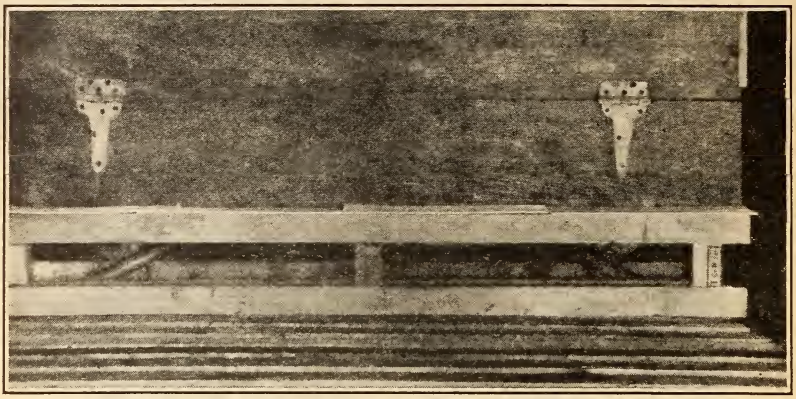

FIG. 4.—Frame constructed of 2 by 4's in position on floor of car in front of opening into ice bunker. The straw buffing at the end of the car was placed on top of this frame between ends of cases and bunker wall. Note the strips of egg case lids nailed on top of frame to keep straw from falling down and blocking bunker opening

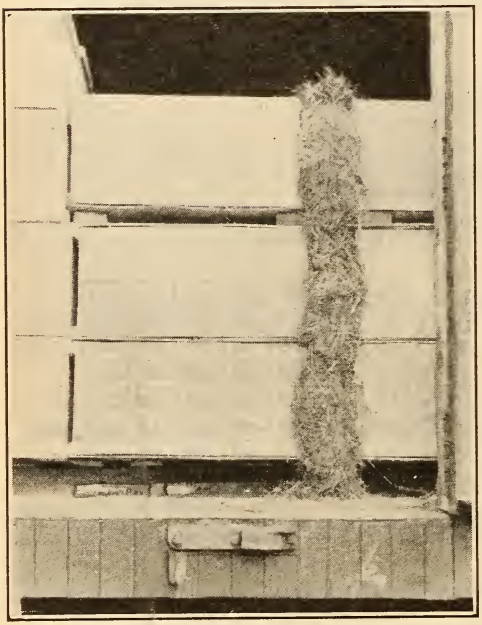

FIG. 5.—Straw buffing in position between cases at center of the car when load is completed. Note the braces made of 2 by 4's in place under the top cases of the tiers three cases high and how these raise the cases so as to lock in position the top cases on the adjoining tier four cases high

frame, taken from the bale in layers, was placed between the cases and the ice bunker wall the entire height of the cases. The cars were so loaded that any excess space occurred at the center of the car and this space was tightly buffed with straw in the same way as at the ends except that no frame was used at the bottom.

All straw-buffed cars were loaded in this way with the exception of shipment C, in which no straw buffing was used at ends of the car, and in shipment E baled hay was used instead of straw because of inability to procure baled straw. On the average, about 4½ to 5 bales of straw were used in buffing a car except where buffing was employed at center only, in which case about 2½ bales were used (fig. 5).

In the car braced with wooden frames, provision racks faced with cleats inside and smooth surfaces outside against cases and bunker walls were placed between cases and bunker wall at each end of the

car and two additional racks similarly faced were placed on top of them to reach to the top of the load. The cars were so loaded that any excess space occurred at the center of the car and this space was tightly braced by means of two provision racks similarly faced and with wedges used between them to take up any looseness. Occasionally the space at the center was sufficient to require three provision racks instead of two. A second row of provision racks placed in the same manner was used on top of the bottom row of racks in order to reach to the top of the load. From 12 to 14 provision racks were used to a car for bracing with the exception of shipment C where four provision racks were used in one end of the car on account of an uneven bunker wall and were omitted in the other end (fig. 6).

In all cars a brace made of 2 by 4's was placed under the top cases of the rows three cases high which were next to the first rows four cases high in order to hold them in position (fig. 5).

The loading, bracing, and buffing of the cars was done under the direct supervision of those in charge of the tests. A detailed plan was made of the location of the packs in the car, of the location of the experimental cases, of the location of impact registers, and exact measurements were made of the spaces occupied by the bracing and buffing at the ends and center of the cars.

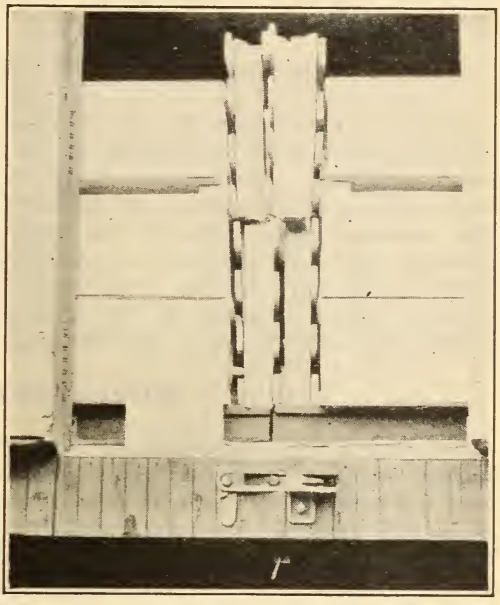

FIG. 6.—Provision or floor racks in position between cases at center of car. Eight racks were used in this position in this car and were made absolutely tight by wedging pieces of board between them

PLACING OF IMPACT RECORDERS

Two impact recording registers were used in each car except in shipment A, when one register was used in each car. Just previous to closing the cars after loading, the impact registers were wound and set and placed in secure positions on top of the cases in the doorway of the car next the wall. On closing the cars, the doors were sealed and a record made of the seals used.

INSPECTION AT DESTINATION

The committee in charge of the tests met the cars at destination. A record was made of the seals before they were broken to ascertain that the cars had not been opened during transit; the impact registers were removed and the date and time of the termination of their records noted on the chart; measurements of the space occupied by the center bracing and buffing were made; and then the cars were unloaded. As the unloading progressed, the covers on 50 to 100 cases

located in various parts of the car were lifted and the top fillers were examined. In shipment F covers on all cases were lifted. In this examination occasional broken eggs were found, particularly long eggs, but not in sufficient numbers to warrant a further examination.

As soon as the unloading had progressed to the point where measurements of the spaces occupied by the bracing and buffing in the end of the cars could be obtained without walking over the top of the load, these measurements were taken. The experimental cases were kept separate from the rest of the load as they were unloaded and removed to a candling room, where they were thoroughly candled and checked and another record was made of the blind checks, checks, and leakers present at destination, together with their exact location in the cases. These records, together with the records made of the same cases at point of shipment, furnish a means of determining the changes which occurred during shipment.

CHANGES IN SPACE OCCUPIED BY BUFFING AND BRACING

Accurate measurements of all unoccupied spaces were taken at loading point and destination to show the actual shifting of the load in transit. In making these measurements there was some variation in the distance at different points across the car and the measurements reported in Table 1 are the average of the greatest and the smallest measurements. The condition of the loads in all cars in the tests upon arrival at destination, while showing some changes in the amount of space occupied by the buffing and bracing, was considered to be tight.

SHIPPING SHOCKS

Following the completion of each shipment the charts from the impact registers were carefully examined to ascertain the number and intensity of the shocks to which the cars had been subjected. This information is summarized in Table 2. In each shipment the two cars were coupled together and remained so until delivered at destination. Variation in the shocks registered in the different cars of the same shipment is therefore apparently due to variation in the recording instruments.

TABLE 1.—*Changes occurring in transit in spaces occupied in cars by buffing and bracing*

Shipment symbol	Date shipped, 1925	Initials and car No.	Shipping point	Destination	Date unloaded, 1925	Bracing or buffing	Average measurement at shipping point					
							A—End		Center		B—End	
							Top	Bottom	Top	Bottom	Top	Bottom
							Ins.	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*
A	Mar. 28	SRL 17327	Enid, Okla.	Boston, Mass.	Apr. 6	Wood	5	5	5	5	5	5
A	do	SRL 16337	do	do	do	Straw	5	5	5	5	5	5
B	Apr. 17	SFRD 6813	Wichita, Kans.	East St. Louis.	Apr. 21	do	7¼	7¼	6⅞	6⅞	7⅛	7⅛
B	do	SFRD 7114	do	do	do	Wood	5⅜	5⅜	10⅝	12	5¼	5¼
C	Apr. 20	RI 67791	Hutchinson, Kans.	East St. Louis.	Apr. 23	do	4⅝	4⅝	3¼	2⅛	(1)	(1)
C	do	RI 67798	do	do	do	Straw	(1)	(1)	8¾	7⅜	(1)	(1)
D	May 2	SRL 16785	Clarinda, Iowa.	Chicago, Ill.	May 5	Wood	5¾	5⅝	6⅞	5½	5¾	5¼
D	do	SRL 18024	do	do	do	Straw	6¾	5½	4¾	4	7½	5½
E	May 16	SRL 17510	Columbus, Nebr.	Washington, D. C.	May 22	Hay	6	6¼	6¼	5⅞	6⅜	6⅜
E	do	SRL 13304	do	do	do	Wood	5	5⅜	8⅞	8¾	5⅛	5½
F	May 29	SRL 18566	Marion, Ind.	Jersey City, N. J.	June 3	Straw	5⅞	5⅛	5⅝	5½	6	5
F	do	SRL 18186	do	do	June 4	Wood	5⅝	5⅜	6½	5⅞	5¾	5¼

Shipping symbol	Average measurement at destination						Gain (+) or loss (−) in spaces occupied by buffing and bracing							
	A—End		Center		B—End		A—End		Center		B—End		Total	
	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
	Ins.	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*
A	6¼	6¼	5¾	5¾	5	5	+1¼	+1¼	+¾	+¾	------	------	+2	+2
A	5⅜	5⅜	5	5	6¾	6¾	+⅜	+⅜	------	------	+1¾	+1¾	+2⅛	+2⅛
B	8¾	9¾	6⅝	5⅝	7	7⅛	+1½	+2½	−¼	−1¼	−⅛	------	+1⅛	+1¼
B	5½	5⅜	11⅝	10⅜	6⅞	5⅝	+⅛	------	+1	−1⅝	+1⅝	+⅜	+2¾	−1¼
C	4½	4½	3⅛	2	1¼	1¼	−⅛	−⅛	−⅛	−⅞	+1¼	+1¼	+1	+¼
C	(2)	(2)	7¾	7	1⅛	1⅛	------	------	−1	−⅜	+1⅛	+1⅛	+⅛	+¾
D	5⅜	5¼	6⅝	5¾	6¼	5½	−⅜	−⅛	−¼	+¼	+½	+¼	−⅛	+⅜
D	6	5⅜	5	4½	7⅜	6¼	−¾	+¼	+¼	+½	−⅛	+¾	−⅝	+1½
E	9	6	5⅝	5¼	5¾	5¾	+3	−⅛	−⅝	−⅝	−⅝	−⅝	+1¾	−1⅜
E	4⅞	5⅛	8¼	8½	5¾	5⅞	−⅛	−¼	−⅝	−¼	+⅝	+⅜	−⅛	−⅛
F	6	5½	5⅜	5½	6⅜	6½	+⅛	+⅜	−¼	------	+⅜	+1½	+¼	+1⅞
F	5	4⅞	5¼	5⅝	6⅞	6⅛	−⅝	−½	−1¼	−¼	+1⅛	+⅞	−¾	+⅛

[1] No buffing.

[2] Tight.

TABLE NO. 2—*Shocks recorded by impact registers*

Shipment symbol	Date shipped	Initials and car No.	Shipping point	Destination	Date unloaded
A	Mar. 28	SRL 17327	Enid, Okla	Boston, Mass	Apr. 6
A	do	SRL 16337	do	do	Do
B	Apr. 17	SFRD 7114	Wichita, Kans	East St. Louis, Ill	Apr. 21
B	do	SFRD 6813	do	do	Do
C	Apr. 20	RI 67791	Hutchinson, Kans	do	Apr. 23
C	do	RI 67798	do	do	Do
D	May 2	SRL 16785	Clarinda, Iowa	Chicago, Ill	May 5
D	do	SRL 18024	do	do	Do
E	May 16	SRL 13304	Columbus, Nebr	Washington, D. C	May 22
E	do	SRL 17510	do	do	Do.
F	May 29	SRL 18186	Marion, Ind	Jersey City, N. J	June 4
F	do	SRL 18566	do	do	June 3

Shipment symbol	Bracing or buffing	Routing	Number of shocks recorded in the different zones of impact register record sheet[1]			
			Zone 1	Zone 2	Zone 3	Zone 4
A	Wood	R. I., I. H. B., M. C., N. Y. C., B. & A., U. F., delivery.	Numerous	7	2	None.
A	Straw	do	do	7	2	Do.
B	Wood	A. T. & S. F. and Wabash	do	2	1	Do.
B	Straw	do	do	3	None.	Do.
C	Wood	R. I.	do	4	None.	Do.
C	Straw	do	do	6	None.	Do.
D	Wood	C. B. & Q. and C. J. delivery	do	2	None.	Do.
D	Straw	do	do	3	None.	Do.
E	Wood	U. P., I. C., I. H. B., Ft. W., and Penn	do	4	2	Do.
E	Hay	do	do	3	1	Do.
F	Wood	Cloverleaf, Erie, and D. L. & W. delivery.	do	3	None.	Do.
F	Straw	do	do	4	2	Do.

[1] Manufacturers of the impact recording instruments claim that zone 1 represents a speed at time of impact under 4 miles per hour; zone 2, 4 to 7 miles; zone 3, 7 to 9 miles; and zone 4, over 9 miles.

CALCULATION OF DAMAGE

In candling and inspecting the eggs at destination care was taken to use the same lines of division with regard to blind checks, checks, and leakers as at point of origin. It should be noted, however, that in a considerable number of the eggs which were slight leakers at shipping point the escaping white had dried and sealed up the egg in such a manner that if they were candled without knowledge of this previous condition they would have been reported as checks rather than as leakers. All such eggs were reported at destination as leakers.

The occurrence of new leakers, checks, and blind checks, and with the change from blind checks to checks and leakers, and from checks to leakers are shown in Table 3, but it is difficult to make a comparison involving all these changes which clearly indicates the relative extent and economic importance of the change. To make the comparison easier, therefore, the total changes occurring have been reduced to a single figure representing the deterioration occurring in transit in terms of money loss.

In making these calculations values were assigned to the various classes of eggs in accordance with the extent to which the shells were broken. These values are arbitrarily assumed without respect to

quality and are unchanged throughout the test, but are believed to represent fair averages for the season covered and for the eggs used.

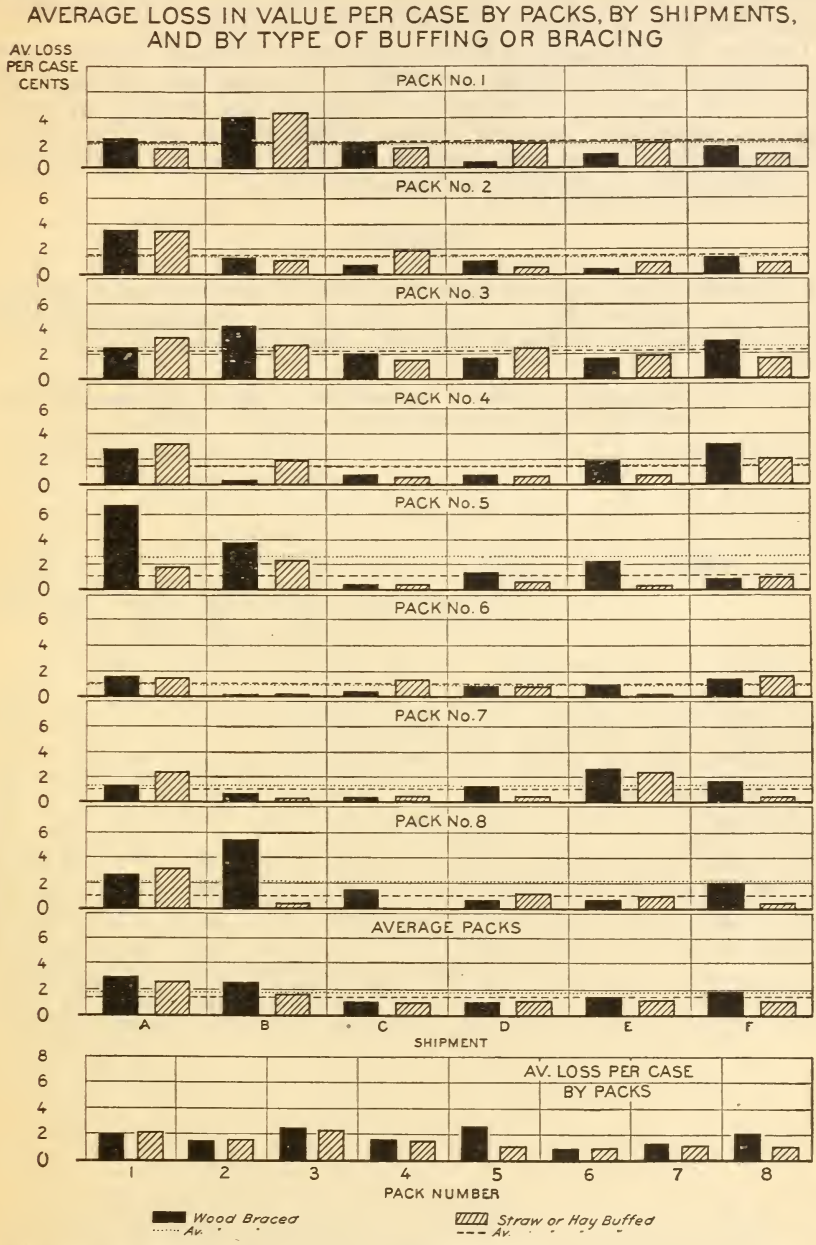

FIG. 7.—Average loss in value per case by packs, by shipments, and by type of buffing or bracing

Sound-shelled eggs are figured at 32 cents per dozen, checks and blind checks at 28 cents, and leakers at 10 cents. The loss in values, therefore, occasioned by new leakers was at the rate of 22 cents per

dozen, by new checks and blind checks 4 cents, and by change from checks and blind checks to leakers 18 cents. Checks and blind checks were figured at the same value and changes from blind checks to checks therefore represent no deterioration in value.

Because of the mass of figures involved, detailed data by cars, by shipment, and by kinds of buffing or bracing are not included, but can be supplied on request addressed to the Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C. A summary of the data by packs and by kind of buffing or bracing is given in Table 3.

FINDINGS

In practically all cases of eggs examined at shipping point, packed ready for shipment by the employees of the establishments from which shipments were made, some damaged eggs were found.

TABLE NO. 3.—*Summary of changes and loss in transit in experimental cases according to pack and according to buffing or bracing*

Pack No.	Straw and hay buffed cars							
	Number of cases inspected	Change in transit						Total loss
		New leakers	New checks	New blind checks	Blind checks to checks	Blind checks to leakers	Checks to leakers	
								Cents
1	12	3	39	19	7		1	26.32
Average per case		.25	3.25	1.58	.58		.08	2.19
2	12	1	29	16	6	1		18.33
Average per case		.08	2.42	1.33	.50	.08		1.53
3	12	3	40	19	5		2	28.15
Average per case		.25	3.33	1.58	.42		.17	2.35
4	12	1	24	17	4		2	18.49
Average per case		.08	2.00	1.42	.33		.17	1.54
5	12		21	11	7	1	1	13.67
Average per case			1.75	.92	.58	.08	.08	1.14
6	12		22	12	4			11.32
Average per case			1.83	1.00	.33			.94
7	12	3	13	11	1			13.49
Average per case		.25	1.08	.92	.08			1.12
8	12		16	14	11	1	1	13.00
Average per case			1.33	1.17	.92	.08	.08	1.08
Total	96	11	204	119	45	3	7	142.77
Average per case		.11	2.13	1.24	.47	.03	.07	1.49

TABLE No. 3.—*Summary of changes and loss in transit in experimental cases according to pack and according to buffing or bracing*—Continued

Pack No.	Wood braced cars							
	Number of cases inspected	Change in transit						Total loss
		New leakers	New checks	New blind checks	Blind checks to checks	Blind checks to leakers	Checks to leakers	
								Cents
1	11	1	34	21	10	1		21.67
Average per case		.09	3.09	1.91	.91	.09		1.97
2	12		23	20	2		2	17.34
Average per case			1.92	1.67	.17		.17	1.45
3	12	2	38	17	6	2	4	30.99
Average per case		.17	3.17	1.42	.50	.17	.33	2.58
4	11	2	20	16			1	17.16
Average per case		.18	1.82	1.45			.09	1.56
5	12	4	24	21	5	1	5	31.33
Average per case		.33	2.00	1.75	.42	.08	.42	2.61
6	12		14	15	5	1		11.17
Average per case			1.17	1.25	.42	.08		.93
7	12	1	30	12	2			15.83
Average per case		.08	2.50	1.00	.17			1.32
8	12	5	34	16	3			25.83
Average per case		.42	2.83	1.33	.25			2.15
Total	94	15	217	138	33	5	12	171.32
Average per case		.16	2.31	1.47	.35	.05	.13	1.82

Pack No.	Total							
	Number of cases inspected	Change in transit						Total loss
		New leakers	New checks	New blind checks	Blind checks to checks	Blind checks to leakers	Checks to leakers	
								Cents
1	23	4	73	40	17	1	1	47.99
Average per case		.17	3.17	1.74	.74	.04	.04	2.09
2	24	1	52	36	8	1	2	35.67
Average per case		.04	2.17	1.50	.33	.04	.08	1.49
3	24	5	78	36	11	2	6	59.14
Average per case		.21	3.25	1.50	.46	.08	.25	2.46
4	23	3	44	33	4		3	35.65
Average per case		.13	1.91	1.43	.17		.13	1.55
5	24	4	45	32	12	2	6	45.00
Average per case		.17	1.88	1.33	.50	.08	.25	1.88
6	24		36	27	9	1		22.49
Average per case			1.5	1.13	.38	.04		.94
7	24	4	43	23	3			29.32
Average per case		.17	1.79	.96	.13			1.22
8	24	5	50	30	14	1	1	38.83
Average per case		.21	2.08	1.25	.58	.04	.04	1.62
Total	190	26	421	257	78	8	19	314.09
Average per case		1.37	2.22	1.35	.41	.04	.10	1.65

The average number of damaged eggs per case at point of shipment for the entire 190 cases examined was 0.16 of a leaker, 7.71 checks, and 2.75 blind checks, making a total of 10.62 eggs or 2.95 per cent.

Two cases, 7B2 and 6E1, were inspected which showed no damaged eggs at shipping point.

Case 5A1 showed the greatest number of damaged eggs at shipping point, with a total of 45, of which 5 were leakers, 28 checks,

and 12 blind checks. The eggs in this shipment were not candled when packed.

The average number of damaged eggs per case for the shipments uncandled at time of packing was 0.27 of a leaker, 9.68 checks, and 3.53 blind checks—a total of 13.48 eggs or 3.74 per cent.

The average number of damaged eggs per case for the shipments candled at time of packing was 0.1 of a leaker, 6.86 checks and 2.4 blind checks—a total of 9.36 eggs or 2.6 per cent.

The average damage per case during transit for the entire 190 cases inspected amounted to 1.37 new leakers, 2.22 new checks, 1.35 new blind checks, 0.41 blind checks changed to checks, 0.04 blind checks changed to leakers, and 0.1 checks changed to leakers.

The average loss in value per case due to damage in transit amounted to 1.65 cents. The greatest loss in value to any case, 5B3, amounted to 7.33 cents. A number of cases showed no loss in value.

For all shipments the straw and hay buffed cars showed a slight but hardly significant advantage over the wood-braced cars with respect to the loss in value occurring during transit. Average loss per case in the straw and hay buffed cars amounted to 1.49 cents and in the wood-braced cars to 1.82 cents.

The relative efficiency of the different packs in terms of the average loss in value per case during transit ranged as follows:

Rank	Kind of pack	Average loss in value
		Cents
1	Standard case, cup flats throughout (pack No. 6)	0.94
2	Cut down case, embossed flats, 4 excelsior pads (pack No. 7)	1.22
3	Standard case, 6 excelsior pads (pack No. 2)	1.49
4	Standard case, standard flats, one-eighth inch deeper fillers, 4 excelsior pads (pack No. 4)	1.55
5	Standard case, embossed flats, cup flats top and bottom (pack No. 8)	1.62
6	Standard case, standard flats, cup flats top and bottom (pack No. 5)	1.88
7	Standard case, 4 excelsior pads (pack No. 1)	2.09
8	Cut down case, 4 excelsior pads (pack No. 3)	2.46

The facts disclosed by this report are commended to the careful consideration of all shippers and receivers.

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June 25, 1926

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